REMARKS

The foregoing amendment amends claims 1, 13, 17 and 18. Pending in the application are claims 1-11, 13 and 17-18, of which claims 1, 13, 17 and 18 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

Claims 1, 13, 17 and 18 are amended to specify that the supply gas introduced to the heat exchanger has a pressure that is lower than atmospheric pressure and the exhaust gas introduced to the heat exchanger has a pressure that is higher than the supply gas. Support for the amendment can be found throughout the original application as filed, at least, for example, on page 4, lines 2-3 and on page 17, lines 9-18. *No new matter is added.*

Amendment of the claims is not to be construed as an acquiescence to any of the objections/rejections set forth in the instant Office Action, and were done solely to expedite prosecution of the application. Applicants reserve the right to pursue the claims as originally filed, or similar claims, in this or one or more subsequent patent applications.

35 U.S.C. §103 Rejections

The amendments to claims 1, 13, 17 and 18 traverses the rejection of claims 1-11, 13, 17 and 18 under 35 U.S.C. §103 as being unpatentable over Voss in view of Reiser (U.S. Patent Number 6,497,971). The cited references, alone or in combination, do not teach or suggest the claimed system for and method of performing heat exchange between a supply gas and an exhaust gas of a fuel cell. Specifically, the cited references fail to teach or suggest introducing to a heat exchanger a supply gas having a pressure lower than atmospheric pressure, i.e., **a negative pressure**, and at the same time introducing to the heat exchanger an exhaust gas having a pressure that is higher than the supply gas, i.e., **compressed by the compressor**.

The Voss reference describes a water-heat exchange type of humidifier 200, but, as recognized by the Examiner, does not disclose a compressor for compressing an exhaust gas, as recited in claim 1, or the fluid pressure regimen recited in claims 13, 17 and 18. The Voss

reference also fails to teach or suggest that an exhaust gas introduced to a heat exchanger has a pressure that is *higher* than a supply gas supplied to a heat exchanger, as recited in claims 1, 13, 17 and 18. Rather, in the Voss reference, because the oxygen content of the exhaust gas is consumed in the fuel cell, the pressure at the exhaust side does not become higher than the supply gas. In particular, as described in Example 4 of the Voss reference, a *compressed* supply gas is used, which has a pressure that is far higher than that of the exhaust gas. Therefore, the Voss reference teaches *away* from the claimed invention.

Furthermore, the Voss reference makes no mention or consideration of the heat generated by an exhaust gas due to the gas compression, as set forth in the claimed invention. Specifically, the Voss reference does not teach or suggest increasing the temperature of an exhaust gas by compressing the exhaust gas before passing the exhaust gas to a heat exchanger and does not teach or suggest any component capable of compressing an exhaust gas. Rather, the Voss reference, in Figures 1 and 2, clearly illustrates an exhaust gas passing directly from an outlet of the fuel cell to an exhaust chamber of a heat and humidity exchanger, without being compressed or having the temperature of the exhaust gas increased.

The Reiser reference does not compensate for the deficiencies of the Voss reference. As recognized by the Examiner, the Reiser reference does not disclose a heat exchanger. The Examiner considers the blowers described in Reiser to be functionally equivalent to the compressor recited in the claims, since blowers inherently compress air passing therethrough, and inherently increase the temperature of air passing therethrough. Applicants respectfully disagree. However, in order to expedite allowance of the present application, Applicants have amended the claims to specify that the exhaust gas has a higher pressure than the supply gas, which has a negative pressure, when the supply gas and the exhaust gas are introduced to the heat exchanger, a feature neither taught nor suggested by the Reiser reference. In Reiser, the supply gas appears to have a pressure that is *above* ambient pressure, rather than a negative pressure, as described in column 2, lines 10-19. The Reiser reference also does not teach or suggest that the pressure of the exhaust gas can be *higher than* the pressure of the supply gas.

Reiser discloses that parts of the exhaust gas are returned to the supply gas side of the fuel cell after passing through the blower. While the present invention returns heat (water) from an exhaust gas to the supply gas side of the fuel cell, Reiser return the *actual* exhaust gas, which has been depleted of oxygen, to the supply gas side of the fuel cell. The recycling of an exhaust gas whose oxygen has been consumed decreases the reaction efficiency of the Reiser system.

In contrast, the use of an exhaust gas having a pressure that is greater than the pressure of a supply gas, as recited in claims 1, 13, 17 and 18, allows for the temperature of the compressed gas to be efficiently utilized, in comparison with the conventional systems described in the cited references. In these conventional systems, the pressure of the exhaust gas is *less* than the pressure of the supply gas, resulting in a less efficient heat transfer. In particular, in the case where a membrane type humidifier is used as the heat exchanger, as set forth in claim 8 of the present invention, since the pressure of the exhaust gas is higher than that of the supply gas, the water can more easily penetrate into the membrane. As a result, the humidification performance of the supply gas is enhanced.

Furthermore, Applicants maintain that motivation to combine the references is lacking. According to the Examiner, motivation to combine the Reiser reference and the Voss reference can be found in the Reiser reference, which seeks to "provide improved methods and apparatus for the delivery of input reactants to fuel cells." Therefore, the Examiner considers that one of ordinary skill in the art would be motivated to use the blower of Reiser to compress, and thereby heat, exhaust air, before passing the exhaust air to the heat exchanger described in Voss to heat the supply gas.

However, the Reiser reference does not teach or suggest that the particular use of a blower would improve a heat exchange process between a supply gas and an exhaust gas, such as the heat exchange process described in Voss. The teachings of Reiser are specific to the particular system described therein. For example, the Reiser reference teaches that a blower can be used to control the temperature, voltage, oxygen concentration, humidity and/or electrical power output of a *fuel cell stack*. However, the Reiser reference does not teach or suggest using a blower to change a property of an *exhaust gas* so that the exhaust gas

can be used to heat a supply gas. Rather, Reiser merely described that the exhaust gas is either recycled or exhausted to the ambient environment and does not teach or suggest that the use of a blower can be beneficial for controlling a parameter an exhaust gas to make the exhaust gas suitable for entering a heat exchanger. Therefore, one of ordinary skill in the art would not be motivated to incorporate the blower described in Reiser in the a different system, such as the system described in Voss.

Furthermore, the Voss system would require substantial reengineering and redesign to accommodate a compressor, since in Voss, the exhaust gas passes directly into the heat exchanger without passing through an intervening component. The humidifier described in Voss is configured to receive exhaust gas directly from the fuel cell and would also require additional modification to receive an exhaust gas that has been compressed. Therefore, Applicants submit that it would not be obvious to include an additional component, such as the blowers described in Reiser, between the outlet of the fuel cell and the humidifier of Voss.

For at least these reasons, Applicants respectfully submit that claims 1-11, 13 and 17-18 distinguish patentably over the cited references.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue. If, however, the Examiner considers that obstacles to allowance of these claims persist, we invite a telephone call to Applicants' representative.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. IIW-002 from which the undersigned is authorized to draw.

Dated: February 23, 2004

Respectfully submitted,

By _____

Anthony A. Laurentano
Registration No.: 38,220
LAHIVE & COCKFIELD, LLP
28 State Street
Boston, Massachusetts 02109
(617) 227-7400
(617) 742-4214 (Fax)
Attorney/Agent For Applicant